

Serial No. 10/554,160  
Atty. Doc. No. 2003P02166WOUS

Amendments To The Claims:

Please amend the claims as shown.

1 – 23 (canceled)

24. (currently amended) A system for influencing an induction gas temperature in a combustion chamber of an internal combustion engine, comprising:

a compression device to compress induced fresh air, ~~and the fresh air having a first temperature ( $T_1$ ) before compression;~~

an expansion device that causes an expansion of the compressed induced fresh air, with the compressed and subsequently expanded fresh air having a second temperature ( $T_2$ ) greater than the first temperature ( $T_1$ ); and

a temperature sensor to record the second temperature ( $T_2$ ) that is arranged in the direction of flow of the fuel/air with reference to the expansion device; and

an exhaust gas recirculation device to combine exhaust gas from an earlier combustion cycle with the fresh air to form a mixture featuring exhaust gas and fresh air;

an exhaust gas cooler connected to the exhaust gas recirculation device to influence the temperature of the exhaust gas by controlling the heat flow within the gas exhaust gas recirculation device;

a control/regulation/computation device which includes a first device for calculating a required exhaust gas temperature, the first device connected to a second device for calculating a coolant through-flow of the exhaust gas cooler, the second device is connected via a coolant flow regulation path to a coolant flow controller;

wherein measured values and set-point values for calculating the required exhaust temperature are assigned to engine operating variables selected from the group consisting of: exhaust gas temperature, recirculated exhaust gas mass, recirculated exhaust gas quantity, air/fuel temperature, air/fuel mass, air/fuel quantity, induction gas temperature, induction gas mass, induction gas quantity, coolant temperature, oil temperature of the coolant, oil flowing through the exhaust gas cooler, coolant mass, oil mass, coolant quantity, oil quantity of the coolant, and oil flowing through the exhaust gas cooler; and

wherein the control/regulation/computation device uses the measured values, set-point values, and the temperature increase of the fresh air from  $T_1$  to  $T_2$  to explicitly influence the combustion chamber temperature by controlling the heat flow to the combustion chamber and thereby the energy level in the combustion chamber.

25. (canceled)

26. (previously presented) The system in accordance with claim 24, wherein the compression device is an exhaust gas turbocharger.

27. (previously presented) The system in accordance with claim 24, wherein the compression device is a compressor.

28. (previously presented) The system in accordance with claim 24, wherein the expansion is performed on a throttle valve.

29. (currently amended) The system in accordance with claim 24, wherein ~~at least one heat exchanger operating as an exhaust gas cooler is provided for reducing the temperature of the re-circulated exhaust gas and a coolant setting valve is provided so that an induction gas temperature can be set or regulated by influencing the coolant through flow through the exhaust gas cooler taking into account measured values or values determined on the basis of technical models~~ in the coolant flow regulation path to set the coolant mass flow.

30. (currently amended) The system in accordance with claim 24, wherein ~~an~~ the exhaust gas cooler is arranged in a separate heat exchanger circuit.

31. (previously presented) The system in accordance with claim 24, wherein the exhaust gas cooler is arranged in an engine coolant circuit.

32. (currently amended) The system in accordance with claim 24, wherein ~~an~~ the exhaust gas cooler is designed as an engine or transmission oil heat exchanger respectively.

33. (canceled)

34. (previously presented) The system in accordance with claim 24, wherein a temperature sensor to record the air/fuel temperature, a temperature sensor to record the exhaust gas temperature at the engine exhaust, an air mass or quantity measurement device respectively to record the air/fuel mass or quantity, and an exhaust gas mass or quantity measuring device to record the exhaust gas mass or quantity are provided.

35. (previously presented) The system in accordance with claim 24, wherein the induction gas temperature is calculated in accordance with equation

$$T_{ASG} = \frac{\dot{m}_{FG} T_{FG} C_{p,FG} + \dot{m}_{AG} T_{AG} C_{p,AG}}{\dot{m}_{FG} C_{p,FG} + \dot{m}_{AG} C_{p,AG}}$$

with

$\dot{m}_{FG}$ : Air/fuel mass flow

$\dot{m}_{AG}$ : Exhaust gas mass flow

$T_{FG}$ : Air/fuel temperature

$T_{AG}$ : Exhaust gas temperature

$T_{ASG}$ : Induction gas temperature

$c_{p,FG}$ : Heat capacity of the air/fuel mixture

$C_{p,AG}$ : Heat capacity of the exhaust gas.

36. (previously presented) The system in accordance with claim 24, wherein the exhaust gas temperature at the heat exchanger outlet is calculated using the following equation system:

$$|\Delta\dot{Q}_{KM}| = |\Delta\dot{Q}_{AG}| = \dot{Q}_{WT};$$

$$\Delta\dot{Q}_{KM} = \dot{m}_{KM} C_{p,KM} (T_{KM,OUT} - T_{KM,IN});$$

$$\Delta\dot{Q}_{AG} = \dot{m}_{AG} C_{p,AG} (T_{AG,IN} - T_{AG,OUT});$$

$$\dot{Q}_{WT} = kA\Delta T_m$$

with

$\dot{Q}$ : Heat flow

$KM$ : Coolant

$AG$ : Exhaust gas

$WT$ : Heat exchanger

$C_p$ : Heat capacity

$k$ : Heat transfer coefficient of the heat exchanger

$A$ : Heating surface of the heat exchanger

$\Delta T_m$  Mean logarithmic temperature difference.

37. (currently amended) A method for influencing an induction gas temperature of an internal combustion engine, comprising:

compressing induced fresh air having a first temperature ( $T_1$ ) before compression;  
expanding the compressed induced fresh air such that the compressed and subsequently expanded fresh air has a second temperature ( $T_2$ ) greater than the first temperature;

recording the second temperature ( $T_2$ ) after the expansion so it can be taken into account within a framework of a regulation of the induction gas temperature;

an exhaust gas recirculation device to combine exhaust gas from an earlier combustion cycle with the fresh air to form a mixture featuring exhaust gas and fresh air;

an exhaust gas cooler connected to the exhaust gas recirculation device to influence the temperature of the exhaust gas by controlling the heat flow within the gas exhaust gas recirculation device;

a control/regulation/computation device which includes a first device for calculating a required exhaust gas temperature, the first device connected to a second device for calculating a coolant through-flow of the exhaust gas cooler, the second device is connected via a coolant flow regulation path to a coolant flow controller;

wherein measured values and set-point values for calculating the required exhaust temperature are assigned to engine operating variables selected from the group consisting of: exhaust gas temperature, recirculated exhaust gas mass, recirculated exhaust gas quantity, air/fuel temperature, air/fuel mass, air/fuel quantity, induction gas temperature, induction gas mass, induction gas quantity, coolant temperature, oil temperature of the coolant, oil flowing through the exhaust gas cooler, coolant mass, oil mass, coolant quantity, oil quantity of the coolant, and oil flowing through the exhaust gas cooler; and

wherein the control/regulation/computation device uses the measured values, set-point values, and the temperature increase of the fresh air from  $T_1$  to  $T_2$  to explicitly influence the combustion chamber temperature by controlling the heat flow to the combustion chamber and thereby the energy level in the combustion chamber.

38. (canceled)

39. (previously presented) The method in accordance with Claim 37, wherein the compression is performed by an exhaust gas turbocharger.

40. (previously presented) The method in accordance with Claim 37, wherein the compression is performed by a compressor.

41. (previously presented) The method in accordance with Claim 37, wherein the expansion is performed on a throttle valve.

42. (currently amended) The method in accordance with Claim 37, wherein ~~exhaust gas is cooled in a heat exchanger operating as an exhaust gas cooler for reducing a temperature of a recirculated exhaust gas and by influencing the coolant throughflow through the exhaust gas cooler by means of a coolant setting valve taking into account measured values or values determined from technical models, the induction gas temperature is set or regulated respectively~~ is provided in the coolant flow regulation path to set the coolant mass flow.

43. (canceled)

44. (previously presented) The method in accordance with Claim 42, wherein the air/fuel temperature, the exhaust gas temperature at the engine exhaust, the air/fuel mass or quantity respectively and the exhaust gas mass or quantity respectively are measured.

45. (previously presented) Method in accordance with Claim 44, wherein the induction gas temperature is calculated in accordance with equation

$$T_{ASG} = \frac{\dot{m}_{FG} T_{FG} C_{p,FG} + \dot{m}_{AG} T_{AG} C_{p,AG}}{\dot{m}_{FG} C_{p,FG} + \dot{m}_{AG} C_{p,AG}}, \text{ with}$$

- $\dot{m}_{FG}$ : Air/fuel mass flow  
 $\dot{m}_{AG}$ : Exhaust gas mass flow  
 $T_{FG}$ : Air/fuel temperature  
 $T_{AG}$ : Exhaust gas temperature  
 $T_{ASG}$ : Induction gas temperature  
 $C_{p,FG}$ : Heat capacity of the air/fuel mixture  
 $C_{p,AG}$ : Heat capacity of the exhaust gas.

46. (previously presented) The method in accordance with Claim 42, wherein the exhaust gas temperature at the heat exchanger outlet is calculated using the following equation system:

$$|\Delta \dot{Q}_{KM}| = |\Delta \dot{Q}_{AG}| = \dot{Q}_{WT};$$

$$\Delta \dot{Q}_{KM} = \dot{m}_{KM} C_{p,KM} (T_{KM,OUT} - T_{KM,IN});$$

$$\Delta \dot{Q}_{AG} = \dot{m}_{AG} C_{p,AG} (T_{AG,IN} - T_{AG,OUT});$$

$$\dot{Q}_{WT} = kA\Delta T_m$$

with

- $\dot{Q}$ : Heat flow  
 $KM$ : Coolant  
 $AG$ : Exhaust gas  
 $WT$ : Heat exchanger  
 $C_p$ : Heat capacity  
 $k$ : Heat transfer coefficient of the heat exchanger  
 $A$ : Heating surface of the heat exchanger  
 $\Delta T_m$ : Mean logarithmic temperature difference.